



# Newsletter

Volume 6, Number 3  
May - June 1989

## At the Arboretum

The Fern Glen, overlooking the East Branch of Wappinger Creek on Lovelace Drive, is currently under reconstruction. The most obvious change is the presence of limestone boulders, placed around the pond to prevent erosion. The fern collection itself has not been affected by the work, and the area remains open to the public.

Catalogues announcing the fall 1989 continuing education program will be mailed out early in August. In addition to announcing regular offerings in landscape design, gardening and botany, the catalogue describes a number of new courses, workshops and ecological excursions. If you are not on our mailing list, please call the Public Education Program office to request a catalogue, or pick one up at the Gifford House.

The IES Newsletter is published by the Institute of Ecosystem Studies at the Mary Flagler Cary Arboretum. Located in Millbrook, New York, the Institute is a division of The New York Botanical Garden. All newsletter correspondence should be addressed to the Editor.

Gene E. Likens, Director  
Joseph S. Warner, Administrator  
Alan R. Berkowitz,  
Head of Education

Editor: Jill Cadwallader  
Design and Printing: Central Press

INSTITUTE OF  
ECOSYSTEM STUDIES  
The New York Botanical Garden  
Mary Flagler Cary Arboretum  
Box AB  
Millbrook, NY 12545  
(914) 677-5343

## Cary Conference - 1989

How are ecosystems similar and how are they different? How can we predict their behavior? How can we apply what we know about them to the environmental challenges facing Earth today? These questions, and more, were addressed at the third Cary Conference, held at the Institute of Ecosystem Studies early in May.

Until relatively recently, most ecologists have studied individual ecosystems — ponds, oceans, fields, woodlots, deserts, mountains, polar ice caps, tropical rainforests — to learn how they work. The data that these scientists have accumulated fill libraries. Increasingly, however, all the Earth's ecosystems are being subjected to environmental stresses, and in order for ecologists to understand global change they must compare ecosystems ... how are oldfields at the Arboretum similar to, or different from, oldfields in Chile, for example, or how do lake ecosystems in the Adirondacks compare with lakes in Australia? Armed with their background data on so many individual ecosystems, they are well prepared to face this challenge.

From May 1st through the 3rd, 47 ecologists from Australia, Canada, Chile, England, Italy, Scotland, Spain, West Germany and the United States joined 18 IES ecologists at Cary Conference-1989, "Comparative Analyses of Ecosystems: Patterns, Mechanisms, and Theories." The goals of the conference were to

encourage application of comparative methods, to address problems and how to solve them, and to bring together scientists from different areas of expertise to look at similarities and differences in ecosystems and approaches to their study.

There have been two previous Cary Conferences. In May 1985 scientists met to consider the "Status and Future of Ecosystem Science," and in May 1987 the subject was "Long-Term Studies in Ecology: Approaches and Alternatives." Planning for the 1989 conference began a year ago. A steering committee of four IES ecologists — Drs. David L. Strayer (chairman), Clive G. Jones, Gene E. Likens and Michael L. Pace — and three from other institutions — Dr. Jerry M. Melillo (The Ecosystems Center, Marine Biological Laboratory, Woods Hole, Mass.), Dr. Harold A. Mooney (Department of Biological Sciences, Stanford University, Calif.) and Dr. Scott Nixon (Graduate School of Oceanography, University of Rhode Island) — determined the conference goals, invited participants, and selected the principal speakers. Each of those speakers was given an "assignment," to address a specific problem relating to Cary Conference-1989 goals.

During the conference blocks of time were set aside between the formal presentations for meetings of small discussion groups, at which topics related to the goals were pursued. At the concluding session, held

*continued on page 3*



*During a break between Cary Conference sessions, IES Director Dr. Gene E. Likens, left, talks with Dr. Judy L. Meyer, University of Georgia; Dr. David L. Strayer (Conference Chairman); and Dr. O. W. Heal, Institute of Terrestrial Ecology, Midlothian, Scotland.*



# Plants Under Stress: How Do They Cope with Insects and Disease?

by Eric Pirius, Vassar College, IES Ecology Communication Intern

As a society we want to know what the future holds for our forests and crops. Our concern is heightened because plants, especially those near urban areas, are being subjected to ever-increasing levels of environmental stress. This stress comes in a variety of forms ... smog, acid rain, increasing amounts of carbon dioxide. How will plants respond to this complex barrage of environmental poisons?

Since 1984, Dr. Clive Jones, a chemical ecologist at the Institute of Ecosystem Studies, and his colleagues have been focusing on this question by doing research on how environmental stresses affect the ability of cottonwood trees to resist insect pests and disease-causing organisms. Cottonwoods are particularly suited for these studies because their physiology is well understood and their fast growth makes them ideal for short-duration greenhouse experiments.

The researchers are focusing on ozone stresses because ozone is a newly emergent pollutant of great potential importance. Ozone in the upper atmosphere is beneficial — it shields us from dangerous ultraviolet rays. However, when it is abundant in the lower atmosphere it can be harmful to plant and animal life. For example, ozone has been shown to reduce a plant's ability to turn water, light and carbon dioxide into energy — the process of photosynthesis — by damaging plant membranes. Unfortunately, while ozone in the upper atmosphere is being depleted, levels in the lower atmosphere have been increasing over the past several decades.

Does ozone stress affect cottonwoods' response to other natural stresses such as insects or disease? To study this question, Dr. Jones and his colleagues have grown cottonwood saplings in the Institute's greenhouse and in field chambers. They use charcoal filters to keep the air around the young trees free from ozone, and then administer a single dose of ozone at levels equal to those found in many urban areas of the Northeast.

In the first set of studies they found that ozone stress significantly altered cottonwoods' ability to resist attack by insects and diseases. Interestingly, resistance to certain pests increased while resistance to other pests decreased. These results raised further questions. What are the physiological and biochemical mechanisms responsible for these changes in resistance? Are the plants' responses to ozone unique, or do other stresses affect the plant in the same ways?

A new three-year grant from the National Science Foundation will allow Dr. Jones' group to address these questions. They hope that cottonwoods can serve as a "model system" for how other fast-growing woody plants might behave. "We believe plants respond in fairly predictable ways to stress and damage," says Dr. Jones, adding that if the basic

characteristics of plant responses to stress and damage are established for the cottonwood, then maybe it will be possible to predict how other species might respond in the face of other environmental changes. In the long run, Dr. Jones' work at IES should help provide insight into the fate of our forests and croplands under increasing levels of environmental stress.



Dr. Clive Jones and his experimental cottonwood trees, in the IES greenhouse.

## Traveling Fellowship for Dr. Jones

Dr. Clive G. Jones has been awarded the 1990 Winston Churchill Traveling Fellowship in the field of the impact of airborne emissions on the natural environment. This award will enable Dr. Jones, a chemical ecologist who has been with the Arboretum and the Institute since 1980, to interact with colleagues in Australia and New Zealand on the subject of relationships between plant stress and insect and disease resistance. Dr. Jones' current research on these relationships is described in the preceding story.

The Winston Churchill Traveling Fellowship is offered by the New York Branch of The English-Speaking Union. Its purpose, as written in a letter to IES director Dr. Gene E. Likens, is "to enable Americans to travel, study and consult with their counterparts in countries of the British Commonwealth of Nations and so create a closer community of interest,

understanding and friendship between the American people and those of the Commonwealth." Each year the award is in a different field, and the amount of the grant varies depending on the grantee's project. Grantees must spend at least six weeks abroad.

Dr. Jones plans to use his Churchill Fellowship over 10 or 12 weeks during 1990 and 1991, and has already contacted colleagues at the Australian National University, the University of Christchurch and a number of other research institutions in the two countries. In addition to collecting data, exchanging information on research questions, giving seminars on his IES work and pursuing other collaborative efforts, he hopes to discuss and plan an international meeting on plant stress and insect and disease resistance.



# Dr. Likens Honored

Dr. Gene E. Likens, director of the Institute of Ecosystem Studies and the Mary Flagler Cary Arboretum and vice-president of The New York Botanical Garden, was recently named recipient of the 1988 Ecology Institute Prize in Limnetic Ecology.

The Ecology Institute (ECI), with headquarters in the Federal Republic of Germany, is an international not-for-profit organization of 36 eminent research ecologists. Each year, ECI selects and honors — in a rotating pattern — a marine, terrestrial or limnetic ecologist distinguished by his or her outstanding scientific achievements. The 1988 prize was to be awarded to a limnetic ecologist — one whose research deals with lakes and

ponds. Members of the ECI Limnetic Ecology Jury charged with selecting the year's winner reviewed nominees and selected Dr. Likens on the basis of his lifetime contributions to limnetic ecology and his standing in the field.

Dr. Likens was co-founder, with Dr. F.H. Bormann of Yale University, of the Hubbard Brook Ecosystem Study in New Hampshire's White Mountains. This ongoing study, started in 1963, has resulted in important discoveries in ecosystem science, including the identification of acid rain in North America. As director of the Institute of Ecosystem Studies, Dr. Likens continues his research at Hubbard Brook and promotes ecological research and

education through Institute programs and his own writing and teaching.

Dr. Likens received his bachelor of science degree from Manchester College in Indiana and his master of science and doctorate degrees from the University of Wisconsin, Madison. He has honorary degrees from Manchester College, Rutgers University and Plymouth State College (New Hampshire), the latter awarded in May 1989 in recognition of his pioneering research at nearby Hubbard Brook. He is on the faculty of Yale, Rutgers and Cornell Universities, and has been director of the Institute since its creation in 1983.

## Perennial Garden

### Highlights

The Perennial Garden at the Mary Flagler Cary Arboretum comprises 800 different species and cultivars of perennials. Some of these to see during the coming weeks are:

#### Late July through mid-September

*Hemerocallis* (Daylilies)  
*Rudbeckia fulgida* var. *sullivani* 'Goldsturm'  
(Black-eyed Susan)  
*Asarum europaeum* (Wild Ginger)  
Ornamental Grass Bed (see below)

#### Early to mid-August

*Hosta plantaginea* var. *grandiflora* (Funkia)  
*Liatris spicata* (Gay Feather)  
*Lobelia* species (Cardinal Flowers)  
*Platycodon grandiflorus* 'Album' (Balloon Flower)

#### Mid- to late August

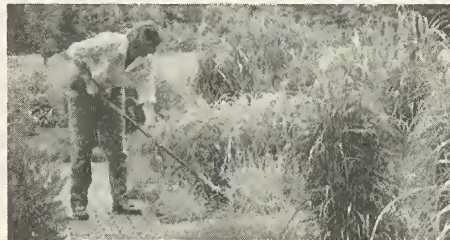
*Kirengeshoma palmata*  
*Phlox paniculata* 'Fujiyama'

#### Mid-August to mid-September

*Chelone glabra* (Turtlehead)  
*Ceratostigma plumbaginoides*  
Herb Garden  
Shankman Rose Garden  
Annual beds (Snapdragons, Zinnias, Impatiens,  
*Lobelia*, Dusty Miller and others)

### Ornamental Grasses

Brightly colored flowers are not the only attractions at the Arboretum's Perennial Garden: filling two small beds in the northwestern corner of the garden are approximately 35 species and varieties of ornamental grasses.



Bonnie Fiero, senior gardener, tends the grasses

Historically, ornamental grasses have not been used in gardens to any great extent, and it is only recently that seed and plant catalogues have begun to include them. Because part of the purpose of the Arboretum's Perennial Garden is to test new plant types, grasses were included in the garden design. Demonstration beds

were set up to test the hardiness of grass species and apply what is learned. This fall, after three years of exposure to almost anything that the four seasons can deliver, the successful grasses will be moved to some of the perennial beds, and over the next few years more grasses will be tested in the two demonstration beds.

When grown alongside perennials, ornamental grasses add height and texture. During the winter, the grasses provide color ... greens, yellows, browns ... against the snow, and their seeds are food for wildlife. Grasses usually need only minimal maintenance, and do not require spraying as they are relatively free of pests and diseases.

"Mini-tours" of the ornamental grass garden are given as part of the Institute's Senior Citizens Day program. Please call Jill Cadwallader at the Public Education Program Office (677-5358) for dates and times.

## YWCA Salutes Kathleen Hogan

Each year the YWCA of Dutchess County selects outstanding women in the workplace to receive its Salute to Women and Industry Award, in recognition of the contributions each woman has made to her company or organization. The Salute Award also recognizes the companies and organizations themselves for their roles in the advancement of women. At the June 7th, 1989 Awards Dinner, Kathleen Hogan, program leader/ecology education at the Institute, was one of the honorees.

Ms. Hogan has been with the IES Public

Education Program for four years, primarily working to help grade school students understand ecology research and concepts through first-hand experience and experimentation. Last year her prototype "Eco-Inquiry" curriculum for fifth and sixth graders was used in 10 Dutchess County classrooms, and she is currently revising the 30-lesson program for use with over 800 students during the coming school year. The long-term goal is to have the curriculum published and eventually incorporated into school science classes throughout New York state and the U.S.

## Conference, from page 1

after a meal at the Valeur Mansion in Rhinebeck, the leader of each discussion group outlined his or her group's conclusions, and Dr. Pace summarized the Conference findings in a final synthesis. IES ecologists Drs. Jonathan J. Cole, Stuart Findlay and Gary M. Lovett will be editing a book reporting the Cary Conference 1989 findings, with chapters written by each of the speakers.

Funding for Cary Conference-1989 was provided by the Mary Flagler Cary Charitable Trust and the National Science Foundation.



## In Memoriam: Herbert J. Jacobi

Herbert J. Jacobi, one of the original trustees of the Mary Flagler Cary Charitable Trust, died in April 1989.

Mr. Jacobi was Mary Flagler Cary's lawyer. He drafted the will that founded the Mary Flagler Cary Charitable Trust, and was the executor of Mrs. Cary's estate upon her death in 1967. An environmentalist with a long-standing interest in land preservation, he became a Cary trustee in 1968 and was deeply involved in the establishment of the Mary Flagler Cary Arboretum.

A memorial service attended by family and friends was held on May 12th at the Arboretum's Teahouse, which had been built by Melbert and Mary Cary in the early 1930s as a weekend retreat.



*In memory of Cary trustee Herbert Jacobi, an English oak tree was planted along the Arboretum's Lovelace Drive. Here, at the May 12th ceremony are Cary trustees Edward A. Ames (left) and William A. Grant, and former trustee Helen Stanton.*

## Summer Calendar

### SUNDAY PROGRAMS

Free public programs are offered on the first and third Sunday of each month, except over holiday weekends. All programs are from one to two hours long, and begin at 2:00 p.m. at the Gifford House on Route 44A unless otherwise noted.

Tentative schedule (please call (914) 677-5359 to confirm the day's topic):

**August 20th** Ozone Pollution, Ozone Depletion and the Greenhouse Effect: Sorting It All Out (Dr. Gary Lovett) — Walk

**September 17th** Air Quality and Plants: the IES Air Pollution Garden (IES Education Program Staff) — Walk/Demonstration

**October 1st** Getting to Know Native Plants for Use in Naturalistic Landscaping (Dr. Mark McDonnell) — Walk

For ecology walks, dress according to the weather with long pants, socks and sturdy, waterproof footwear. In case of inclement weather, call (914) 677-5358 after 1 p.m. to learn the status of the day's program.

### IES SEMINARS

The Institute's weekly program of scientific seminars featuring lectures by visiting scientists or Institute staff will resume in September. All seminars are held in the Plant Science Building on Fridays at 3:30 p.m. Admission is free.

### OUTDOOR SCIENCE CENTER

Located behind the Gifford House Visitor and Education Center, the Outdoor Science Center features: "What is an ecosystem?", a walk-through pond showing the components of an ecosystem; **Acid Rain Study Ponds**, eight mini-ponds exposed to simulated acid rain and eight identical mini-ponds serving as untreated experimental controls; and the **Air Pollution Garden**, demonstrating how plants grown in an ozone-free chamber compare with those grown in the open air. The Outdoor Science Center is open throughout the summer during Arboretum hours. Call in advance for information on guided tours, or come and explore on your own. Admission is free with a visitor permit.

### GREENHOUSE

The public is invited to visit the greenhouse during Arboretum hours. There is no admission fee, but visitors should first stop at the Gifford House for a free permit.

### GIFT SHOP

**Senior Citizens Days:** On Wednesdays senior citizens receive a 10% discount on all purchases (except sale items). Call 677-5358 weekdays for information on special midday programs held on the last Wednesday of the summer months.

### ARBORETUM HOURS

(Summer Hours: May 1 - September 30)

The **Arboretum** is open Monday through Saturday, 9 a.m. to 6 p.m.; Sunday 1 - 6 p.m. (The **Greenhouse** and **Plant Science Building** continue to be closed to visitors at 4 p.m. during summer hours.)

The **Gift and Plant Shop** is open Tuesday through Saturday 11 a.m. to 5 p.m. and Sunday 1 - 5 p.m. (closed weekdays from 1 - 1:30 p.m.). (The **Arboretum** and **Shop** are closed on public holidays.)

All visitors must pick up a free permit at the Gifford House for access to the Arboretum. Permits are available up to one hour before closing time.

### MEMBERSHIP

Become a member of the Mary Flagler Cary Arboretum. Benefits include a special member's rate for IES courses and excursions, a 10% discount on purchases from the Gift Shop, free subscriptions to the IES Newsletter and Garden (the beautifully illustrated magazine for the enterprising and inquisitive gardener), and parking privileges and free admission to the Enid A. Haupt Conservatory at The New York Botanical Garden in the Bronx. Individual membership is \$30; family membership is \$40. For information on memberships, contact Janice Claiborne at (914) 677-5343.

*For more information, call (914) 677-5359 weekdays from 8:30 - 4:30*

INSTITUTE OF  
ECOSYSTEM STUDIES  
The New York Botanical Garden  
Mary Flagler Cary Arboretum  
Box AB, Millbrook, New York 12545



# Newsletter

Volume 6, Number 3  
May - June 1989

Nonprofit Org.  
U.S. Postage  
PAID  
Millbrook, N.Y.  
Permit No. 16



100% Recycled  
Paper